

Chapter 13 - Reports

Reports are a method of taking data stored in the various InRoads files and presenting it in a readable format.

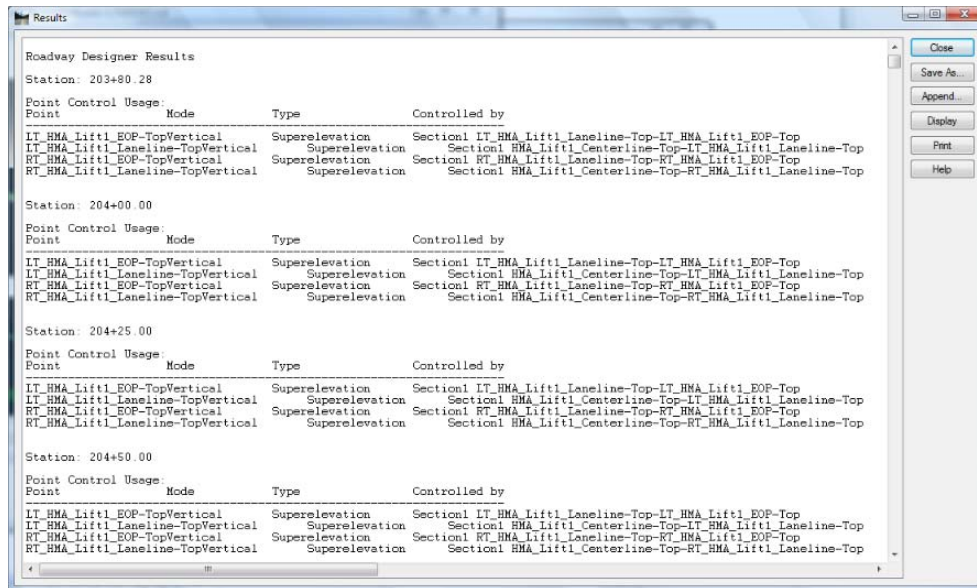
Chapter Objectives:

- To describe where the data used to generate reports is stored.
- To present commonly used reports.
- To create various reports and use different report styles.
- To learn how to change the basic format of XML Reports.

Where Reports Come From

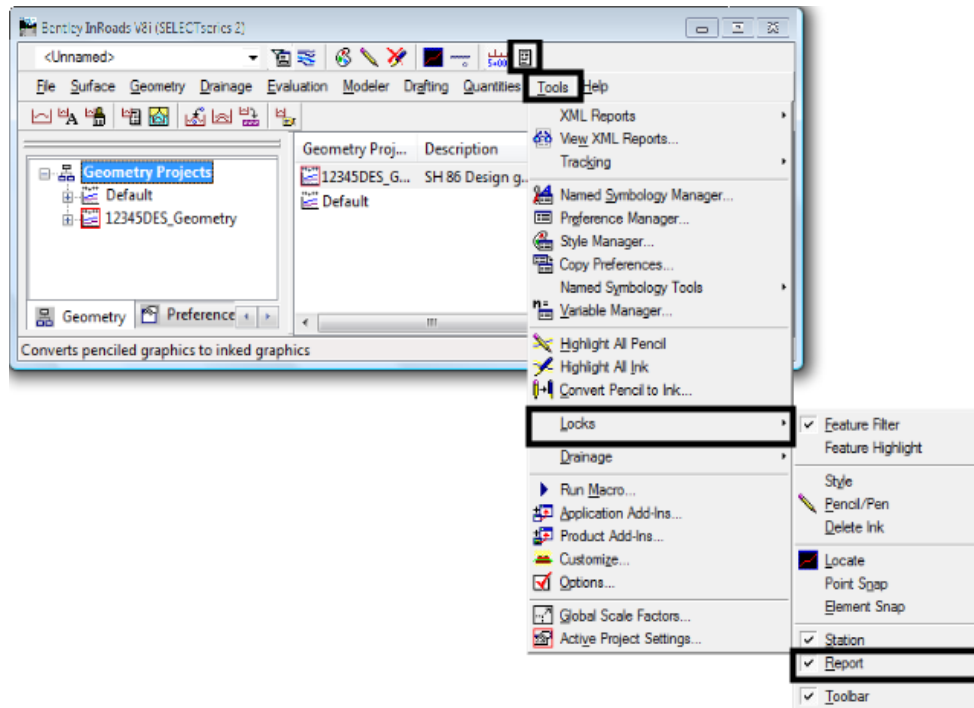
Command Generated Reports

Some reports are generated automatically as part of a command's execution. These are typically displayed in a Results window. An example of this type of report comes from processing a corridor in Roadway Designer.



The data in the **Results** window can be saved by selecting the **Save As** button. The saved file is in Plain Text format and can be opened in **Notepad**, **Wordpad**, or **Word**. The data can also be printed by selecting the **Print** button.

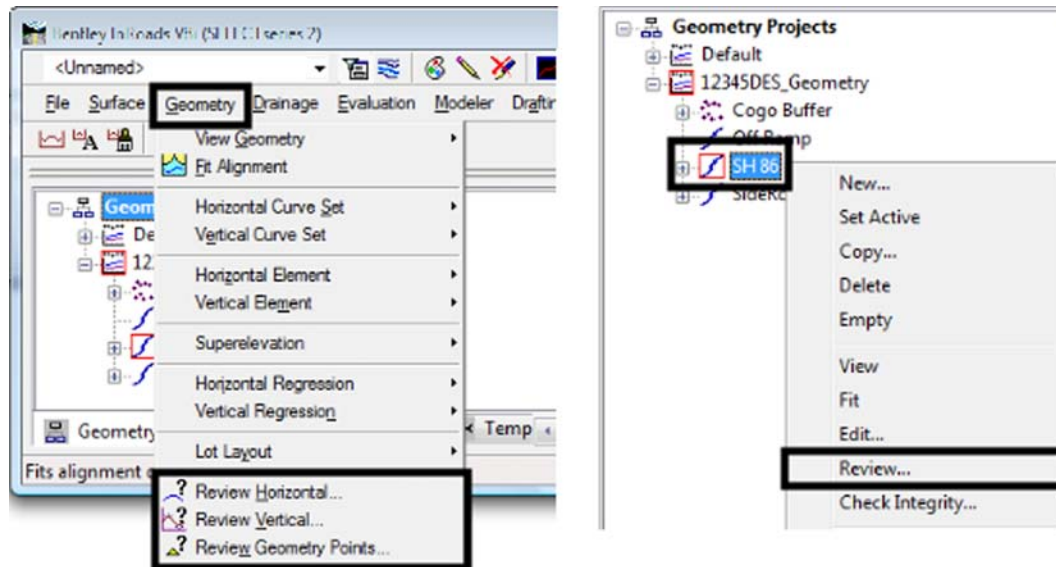
Command generated reports are enabled/disabled by toggling on or off the **Report Lock**. The **Report Lock** is under **TOOLS > LOCK** on the InRoads menu bar or on the button bar.



the format of command generated reports is set in the program and cannot be changed.

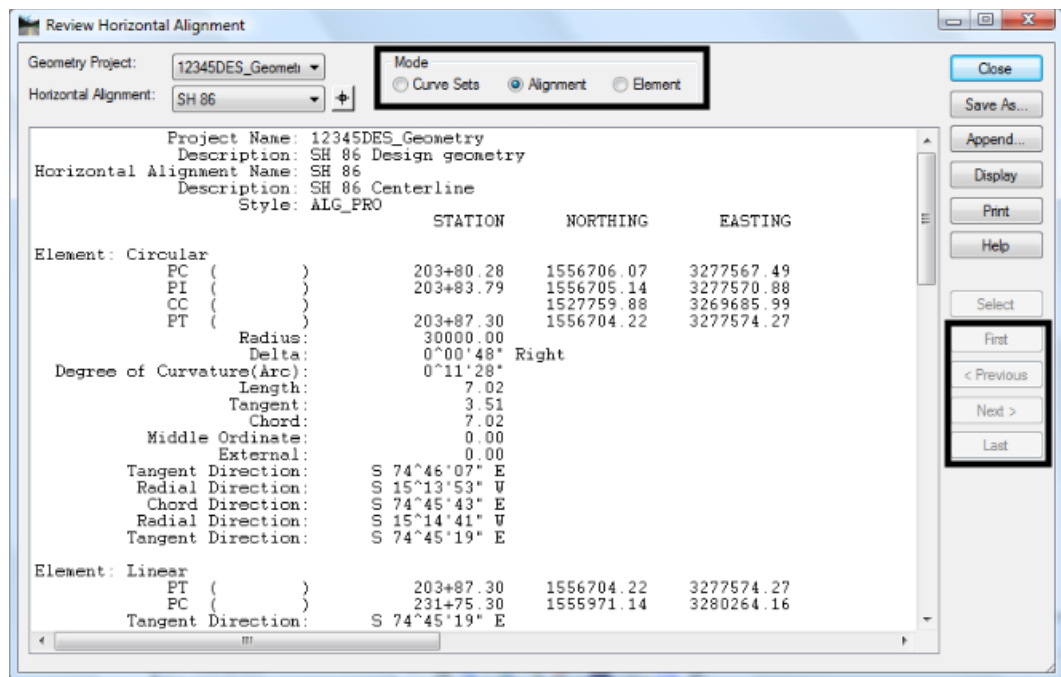
Review Reports

Review reports are generated by reviewing data (usually horizontal or vertical geometry). These are displayed by selecting **Geometry > Review Horizontal**, **Review Vertical** or **Review Geometry Point** from the InRoads menu bar or by <R> on the desired alignment and selecting **Review**.



The format of alignment review reports can be modified in a limited manner by selecting the **Mode**. The modes available for horizontal alignments are **Alignment**, **Element**, and **Curve Set**. The modes for Vertical alignments are **Alignment** and **Element**. The data displayed is based on the mode is as follows:

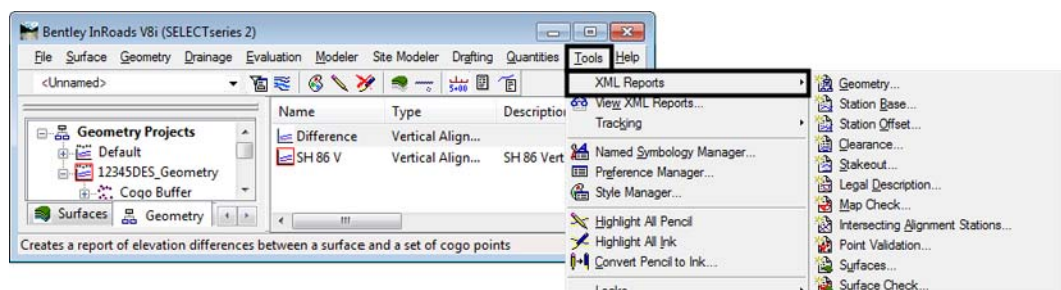
- **Alignment** – Data pertaining to all elements of the alignment is displayed.
- **Element** – Data pertaining to a single element of the alignment is displayed. Element data is accessed using the **First**, **Last**, **Next**, and **Previous** buttons in the report dialog box.
- **Curve Set** – Data pertaining to all of the arc elements is displayed.



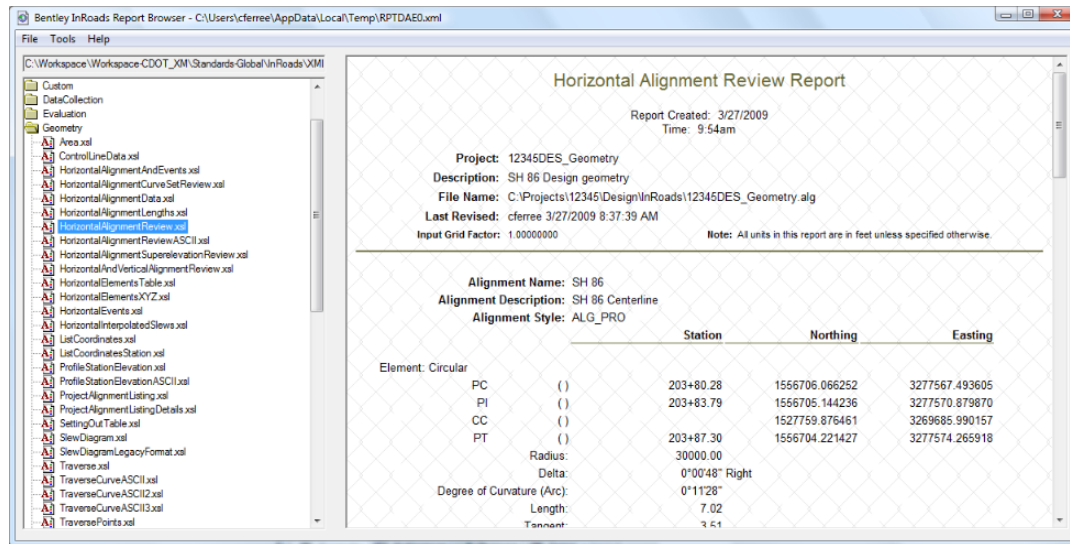
The data in the **Review** window can be saved by selecting the **Save As** button. The saved file is in plain text (TXT) format and can be opened in **Notepad**, **Wordpad**, or **Word**. The data can also be printed by selecting the **Print** button.

XML Reports

With the exception of the End Area Volume report, which is created from the command's dialog box, XML reports are accessed from **Tools > XML Reports** from the InRoads menu bar.



The reports are displayed in the Bentley InRoads Report Browser. XML Style Sheets are used to format the data. The report format is changed by selecting the desired style sheet from the style sheet list on the left side of the dialog box.



Commonly Used Reports

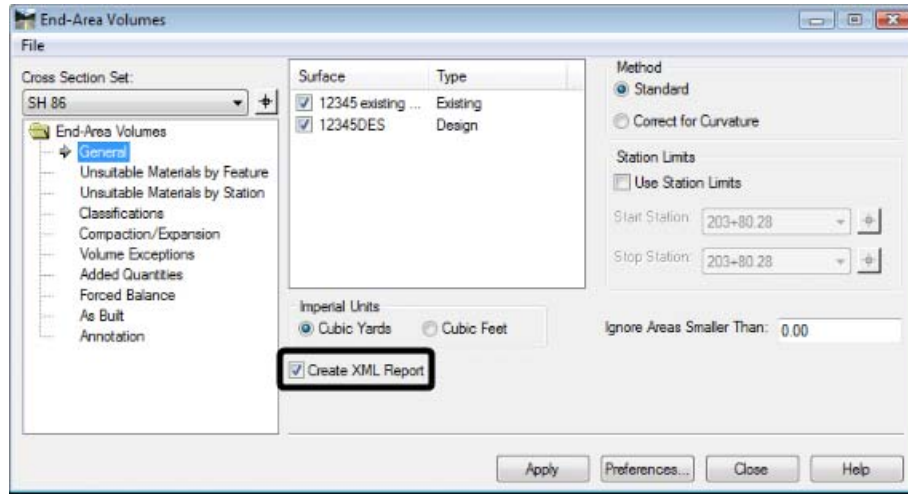
There are many reports and formats that can be generated from InRoads. Some of the more common reports used by CDOT are described in this section.

End Area Volume Reports

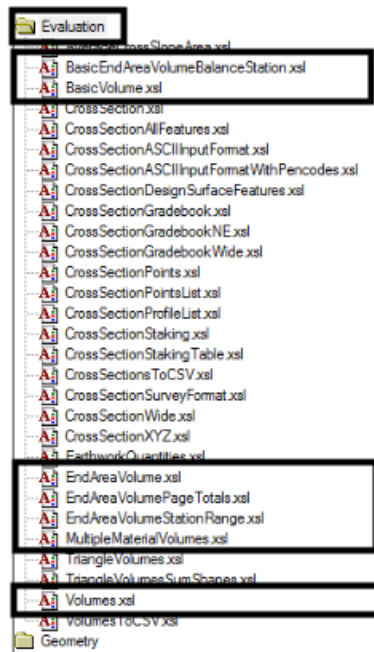
The End Area Volume report presents data generated by InRoads in a tabular format. This report is generated from the *End Area Volumes* command. A set of cross sections with an existing surface and a design surface is required to create this report. Create an End Area Volume report using the following steps:

1. Select **Evaluation > Cross Section > Cross Sections** from the InRoads menu bar.
2. Select **End-Area Volumes > General** from the dialog box explorer.

3. Toggle on **Create XML Report**.



4. Make the other settings in the End Area Volumes dialog box as desired. These options are explained in [Chapter 12 - Volumes and Mass Haul Diagram](#).
5. <D> **Apply**. The **Bentley InRoads Report Browser** is displayed.
6. Select the desired style sheet from the **Evaluation** folder.



The following style sheets are used with the End Area Volume report:

- ◆ **BasicEndAreaVolumeBalanceStation.xlsl** – This style sheet shows calculated and adjusted areas and volumes, a grand total, and highlights balanced stations.

Baseline Station	Station Quantities								Mass Ordinate
	Cut				Fill				
	Factor	Area	Volume	Adjusted	Factor	Area	Volume	Adjusted	
224+00.00	1.00	0.00	0.00	0.00	1.00	305.99	1290.31	1290.31	1073.18
225+00.00	1.00	0.00	0.00	0.00	1.00	116.51	782.40	782.40	290.78
226+00.00	1.00	24.20	44.81	44.81	1.00	48.26	305.13	305.13	30.46
226+19.70									0.00
227+00.00	1.00	9.86	63.07	63.07	1.00	69.29	217.69	217.69	-124.16
228+00.00	1.00	11.99	40.47	40.47	1.00	59.80	239.06	239.06	-322.75

- ◆ **BasicVolume.xlsl** - This style sheet shows calculated and adjusted areas and volumes and a grand total.

Baseline Station	Station Quantities								Mass Ordinate
	Cut				Fill				
	Factor	Area	Volume	Adjusted	Factor	Area	Volume	Adjusted	
258+00.00	1.00	148.32	670.37	670.37	1.00	9.26	19.71	19.71	6451.93
259+00.00	1.00	144.85	542.91	542.91	1.00	10.28	36.19	36.19	6958.65
260+00.00	1.00	163.79	571.56	571.56	1.00	10.43	38.35	38.35	7491.87
260+43.16	1.00	163.75	261.80	261.80	1.00	12.51	18.34	18.34	7735.33
Grand Total:			22907.09	22907.09			15171.76	15171.76	

- ◆ **EndAreaVolume.xlsl** – This style sheet displays the same information as the **BasicEndAreaVolumeBalanceStation.xlsl** style sheet with added quantities information for cut and fill included.
- ◆ **EndAreaVolumePageTotals.xlsl** - This style sheet shows calculated and adjusted areas and volumes, Added Quantities volumes, a grand total, and page totals

Baseline Station	Station Quantities								Added Quantities								Mass Ordinate
	Cut				Fill				Cut				Fill				
	Factor	Area	Volume	Adjusted	Factor	Area	Volume	Adjusted	Factor	Volume	Adjusted	Factor	Volume	Adjusted			
256+00.00	1.00	332.21	1224.21	1224.21	1.00	0.00	0.04	0.04	1.00	0.00	0.00	1.00	0.00	0.00	4792.91		
257+00.00	1.00	213.68	1010.92	1010.92	1.00	1.38	2.56	2.56	1.00	0.00	0.00	1.00	0.00	0.00	5801.27		
258+00.00	1.00	148.32	670.37	670.37	1.00	9.26	19.71	19.71	1.00	0.00	0.00	1.00	0.00	0.00	6451.93		
259+00.00	1.00	144.85	542.91	542.91	1.00	10.28	36.19	36.19	1.00	0.00	0.00	1.00	0.00	0.00	6958.65		
260+00.00	1.00	163.79	571.56	571.56	1.00	10.43	38.35	38.35	1.00	0.00	0.00	1.00	0.00	0.00	7491.87		
260+43.16	1.00	163.75	261.80	261.80	1.00	12.51	18.34	18.34	1.00	0.00	0.00	1.00	0.00	0.00	7735.33		
Page Total:		4281.77	4281.77				115.18	115.18		0.00	0.00		0.00	0.00			
Grand Total:		22907.09	22907.09				15171.76	15171.76		0.00	0.00		0.00	0.00			

- ◆ **EndAreaVolumeStationRange.xml** - This style sheet shows calculated and adjusted areas and volumes, Added Quantities volumes, and Station Range Totals. The station range is set to 700 feet.

Baseline Station	Station Quantities - Cut				Station Quantities - Fill				Added and Material Quantities				Mass Ordinate	
	Factor	Area	Volume	Adjusted	Factor	Area	Volume	Adjusted	Volume	Adjusted	Volume	Adjusted		
203+80.28	1.00	177.19	0.00	0.00	1.00	7.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
204+00.00	1.00	175.71	128.86	128.86	1.00	7.03	5.12	5.12	0.00	0.00	0.00	0.00	0.00	123.73
205+00.00	1.00	165.36	631.61	631.61	1.00	8.79	29.29	29.29	0.00	0.00	0.00	0.00	0.00	726.05
206+00.00	1.00	156.50	596.04	596.04	1.00	16.77	47.33	47.33	0.00	0.00	0.00	0.00	0.00	1274.76
207+00.00	1.00	160.17	586.42	586.42	1.00	35.36	96.53	96.53	0.00	0.00	0.00	0.00	0.00	1764.65
208+00.00	1.00	154.51	582.73	582.73	1.00	33.00	126.59	126.59	0.00	0.00	0.00	0.00	0.00	2220.79
209+00.00	1.00	146.44	557.31	557.31	1.00	62.39	176.65	176.65	0.00	0.00	0.00	0.00	0.00	2601.46
210+00.00	1.00	185.74	615.16	615.16	1.00	9.96	133.97	133.97	0.00	0.00	0.00	0.00	0.00	3082.64
Station Range Totals:		3698.13	3698.13			615.49	615.49		0.00	0.00	0.00	0.00		

- ◆ **MultipleMaterialVolumes.xml** - This style sheet shows calculated and adjusted areas and volumes. It also calculates quantities for existing substrata surfaces.
- ◆ **Volumes.xml** - This style sheet shows calculated and adjusted areas and volumes and the areas and volumes for component materials and unsuitable material.

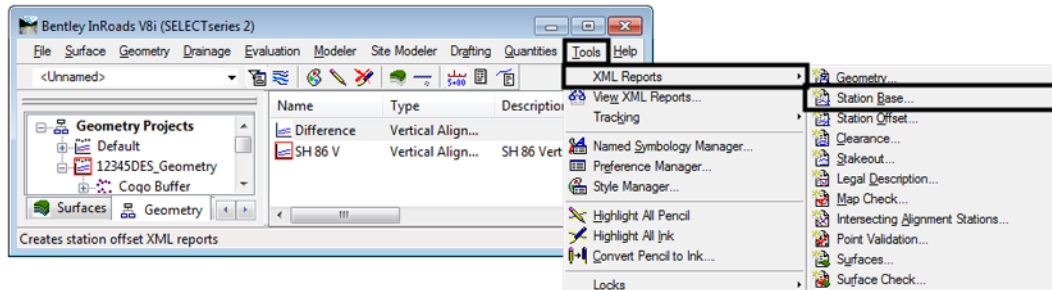
Station	Type	Area	Volume	Factor	Adjusted Volume	Included in Mass Ordinate?	Mass Ordinate
204+00.00							57.95
	Normal Cut:	113.17	83.31	1.00	83.31	Yes	
	Normal Fill:	7.03	5.12	1.00	5.12	Yes	
	Added Cut:	0.00	0.00	1.00	0.00	Yes	
	Added Fill:		0.00	1.00	0.00	Yes	
	Default (replaced):	27.27	20.23	1.00	20.23	Yes	
	Default (not replaced):	62.54	45.55	1.00	45.55	No	
	Total Default:	89.81	65.79	1.00	65.79		
	D_SUBBASE:	108.00	78.87	1.00	78.87	No	
	D_HMA_Pvmt:	36.75	26.84	1.00	26.84	No	
	D ABC Class 6:	27.00	19.72	1.00	19.72	No	

Station Base and Station Offset Reports

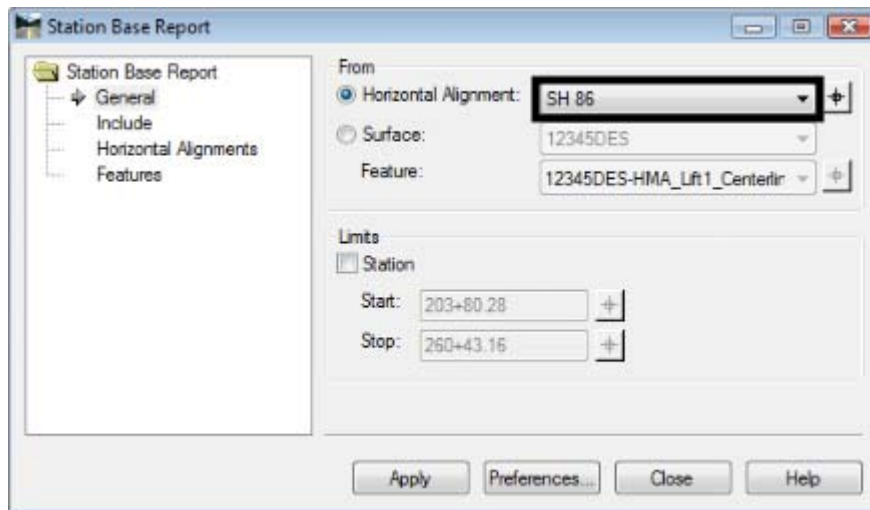
These reports are used to calculate the offset distance between two horizontal alignments, a horizontal alignment and a surface feature, or two surface features. They operate in a similar manner. They both measure from the alignment or feature selected on the General leaf (in the From area) to the specified alignment or feature. Measurements are made perpendicular to the “From” alignment or feature. Stationing for the Station Base report is controlled by the “From” alignment or feature. The specified alignment or feature (identified on the Horizontal Alignments and Features leaves) control stationing for Station Offset reports.

The Station Base and Station Offset Reports are useful in determining gore stations and distances to the right of way. To create a Station Base or Station Offset report (the station base report is used in this example) follow the steps below:

1. Select **Tools > XML Reports > Station Base** from the InRoads menu bar.

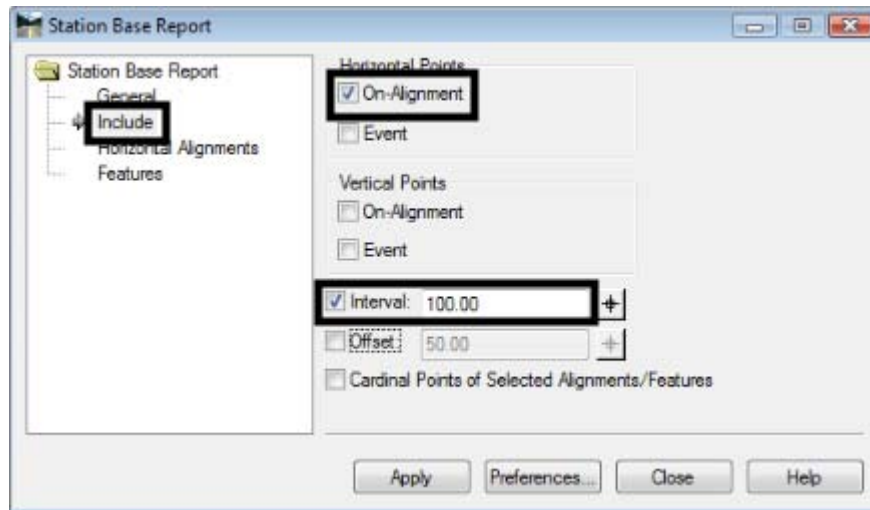


2. On the **General** leaf of the **Station Base Report** dialog box, select the desired **Horizontal Alignment**. In this example **SH 86** is used.

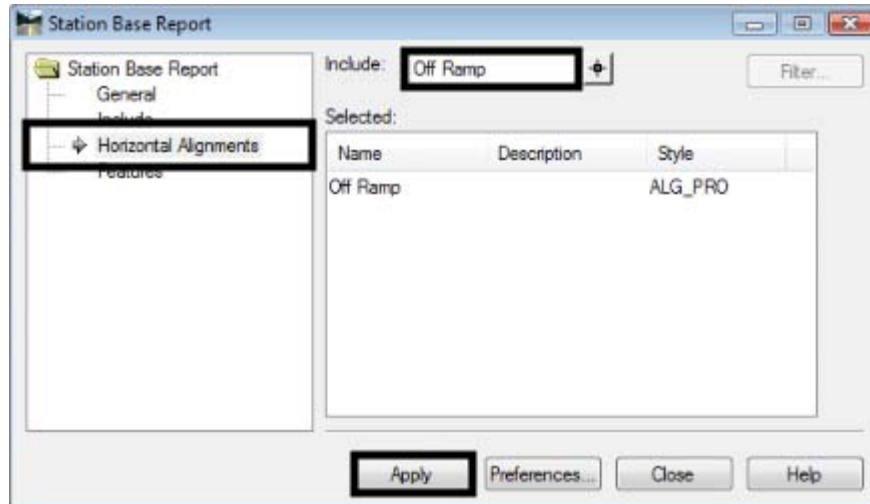


3. Select the **Include** leaf.
4. In the **Horizontal Points** area, toggle on **On-Alignment**.
5. Toggle on **Interval**.

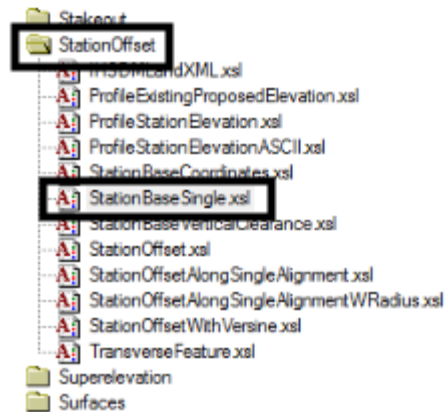
6. In the **Interval** field, key in **100**.



7. Select the **Horizontal Alignments** leaf.
8. In the **Include** field, key in the desired **alignment name** (**Off Ramp** in this example) and press the **Tab** key.
9. **<D> Apply**. This displays the **Bentley InRoads Report Browser**.



10. In the **Bentley InRoads Report Browser**, select the **StationBaseSingle.xml** from the **StationOffset** folder in the left pane.



11. Review the report in the left pane.

Station Base Report					
Report Created: 4/1/2009 Time: 1:13pm					
Project: 12345DES_Geometry					
Description: SH 86 Design geometry					
Baseline (Active) Alignment: SH 86					
File Name: C:\Projects\12345\Design\InRoads\12345DES_Geometry.alg					
Last Revised: cferree 4/1/2009 11:19:47 AM					
Input Grid Factor: 1.00000000					
Note: All units in this report are in feet unless specified otherwise.					
----- Baseline Alignment -----			----- Offset Alignment -----		
Station	Distance to Offset Point	Radial Direction	Station	Distance to Offset Point	Radial Direction
Offset (Specified) Alignment: Off Ramp					
205+00.00	0.00	S 15°14'41" W	1+00.00	24.00	S 15°14'41" W
206+00.00	0.00	S 15°14'41" W	2+00.00	24.00	S 15°14'41" W
207+00.00	0.00	S 15°14'41" W	3+00.00	24.00	S 15°14'41" W
208+00.00	0.00	S 15°14'41" W	4+00.00	24.00	S 15°14'41" W
209+00.00	0.00	S 15°14'41" W	5+00.00	24.00	S 15°14'41" W
210+00.00	0.00	S 15°14'41" W	6+00.00	24.00	S 15°14'41" W
211+00.00	0.00	S 15°14'41" W	7+00.00	24.00	S 15°14'41" W
212+00.00	0.00	S 15°14'41" W	8+00.15	28.69	S 20°47'52" W

The important columns are:

- ◆ Column 1 – This is the station on the “From” alignment. This is where the measurement originates.
- ◆ Column 4 – This is the station on the alignment selected on the Horizontal Alignments leaf. It is the point measured to.
- ◆ Column 5 – This is the distance measured.

Other style sheets that are used with the Station Base and Station Offset reports are:

- ◆ **StationBaseCoordinates.xml** – This style sheet displays the “From” alignment station, the offset distance, and the X, Y, and Z coordinates of the specified alignment. The Z coordinate is the specified alignment’s vertical alignment.

Active Alignment (SH 86) Station	Perpendicular Distance from Active Alignment to Specified Alignment (Off Ramp) Offset is 0.00	Specified Alignment Coordinates (SH 86 V)		
		X	Y	Z
205+00.00	24.00	3277676.688520	1556651.432611	6600.0000
206+00.00	24.00	3277773.169669	1556625.138358	6600.0000
207+00.00	24.00	3277869.650819	1556598.844106	6600.0000
208+00.00	24.00	3277966.131969	1556572.549853	6600.0000
209+00.00	24.00	3278062.613119	1556546.255600	6600.0000
210+00.00	24.00	3278159.094269	1556519.961348	6600.0000

Note: The vertical alignment listed under *Specified Alignment Coordinates* is the child of the *Active Alignment*. The data in the *Z* column comes from the vertical alignment attached to the *Specified Alignment*.

- ◆ **StationBaseVerticalClearance.xml** - This style sheet displays the “From” alignment station, the offset distance, and the elevation difference between the “From” vertical alignment and the specified vertical alignment. This report is useful when defining vertical alignments for merging alignments.

Active Alignment Station (SH 86)	Perpendicular Distance from Active Alignment to Specified Alignment Offset is 0.00 (Off Ramp)	Vertical Clearance to Off Ramp
205+00.00	24.00	32.7657
205+50.00	24.00	32.6232
206+00.00	24.00	32.4808
206+50.00	24.00	32.3383
207+00.00	24.00	32.1959
207+50.00	24.00	32.0535
208+00.00	24.00	31.9110
208+50.00	24.00	31.7686

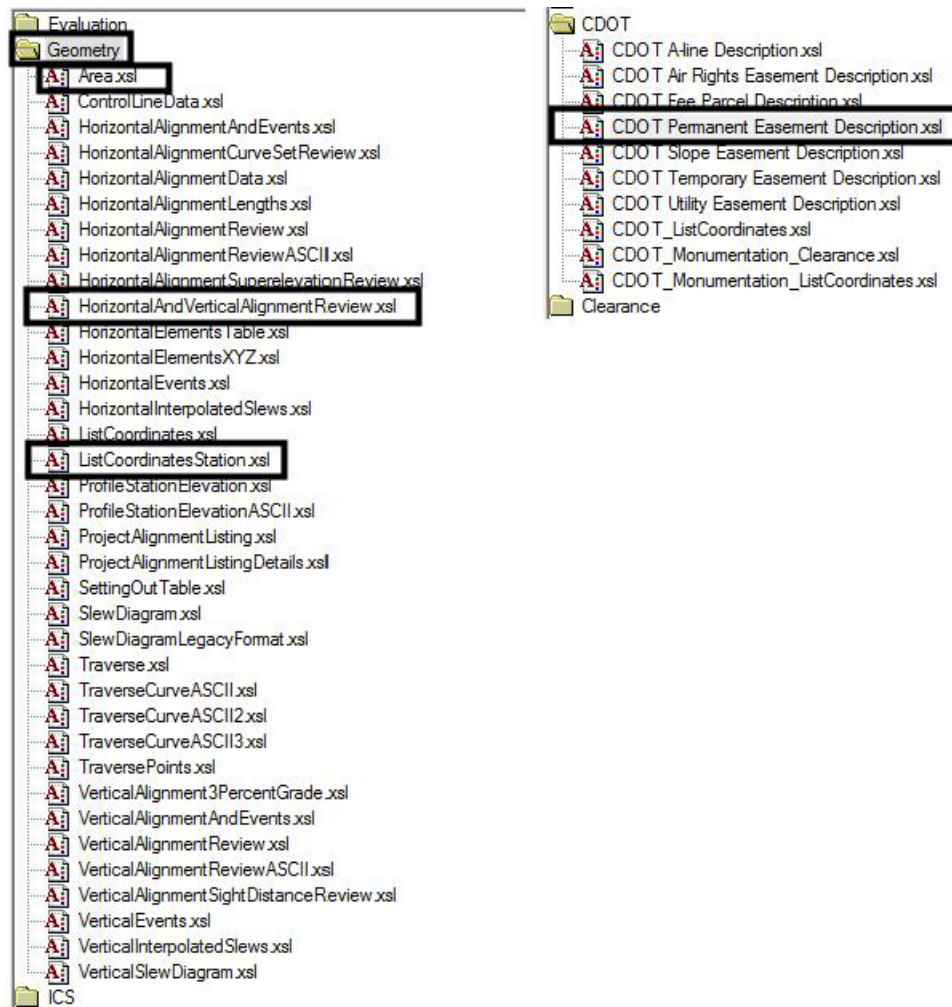
Geometry Reports

A geometry report can be used with a large number of style sheets to produce legal descriptions, calculate areas, and review alignment data. These reports can be generated for a single alignment or multiple alignments. To create a geometry report:

1. Select **Tools > XML Reports > Geometry** from the InRoads menu bar. This displays the Geometry Reports dialog box.
2. In the **Include** field of the **Horizontal Alignments** area, key in the desired **alignment name**. An “*” can be used to select all of the alignments in the geometry project.
3. In the **Include** field of the **Cogo Points** area, key in the desired **point name**. An “*” can be used to select all of the cogo points in the geometry project.
4. Toggle on **Include Vertical Alignments**, if desired.
5. Toggle on **Include Vertical Event Points**, if desired.

6. Toggle on **Include Horizontal Event Points**, if desired.
7. Toggle on **Interval** and key in a value, if desired. With the Interval toggled off, data is collected at alignment cardinal points only. When the Interval is toggled on, data is collected at the interval along the alignment and at the cardinal points.
8. <D> **Apply** to create the report. The **Bentley InRoads Report Browser** is displayed.

Most of the style sheets in the Geometry and CDOT folders can be used with geometry reports. Some useful style sheets are shown in the illustration below as they appear in the style sheet explorer.



Examples of the style sheets highlighted above are shown here. These are by no means the only style sheets that should be used. They are, however, representative of the type of geometry report formats.

Area Report			
Report Created: 4/8/2009 Time: 7:48am			
Project: 12345DES_Geometry			
Description: SH 86 Design geometry			
File Name: C:\Projects\12345\Design\InRoads\12345DES_Geometry.alg			
Last Revised: cferree 4/8/2009 7:47:23 AM			
Input Grid Factor: 1.00000000			
Note: All units in this report are in feet unless specified otherwise.			
Lot	Area (sq ft)	Area (acres)	Perimeter (ft)
Lot1	64036.36	1.4701	1343.78

- ◆ **Area.xml** – This style sheet displays the area in square feet, the area in acres, and the length of the perimeter for closed alignments.

Horizontal and Vertical Alignment Review Report					
Report Created: 4/8/2009 Time: 8:46am					
Project: 12345DES_Geometry					
Description: SH 86 Design geometry					
File Name: C:\Projects\12345\Design\InRoads\12345DES_Geometry.alg					
Last Revised: cferree 4/8/2009 7:47:57 AM					
Input Grid Factor: 1.00000000					
Note: All units in this report are in feet unless specified otherwise.					
Horizontal Alignment: Off Ramp					
Horizontal Description:					
Horizontal Style: ALG_PRO					
			<u>Station</u>	<u>Northing</u>	<u>Easting</u>
Element: Linear					
	POB	()	1+00.00	1556651.432611	3277676.688520
	PC	()	7+03.23	1556492.817221	3278258.693853
	Tangential Direction:		S 74°45'19" E		
	Tangential Length:		603.23		
Element: Circular					
			7+03.23		
	Chord Direction:		S 53°17'33" E		
	Radial Direction:		S 58°10'13" W		
	Tangent Direction:		S 31°49'47" E		
Vertical Alignment: Off Ramp					
Vertical Description:					
Vertical Style: ALG_EXISTING					
			<u>Station</u>	<u>Elevation</u>	
Element: Linear					
	POB		1+00.00	6600.0000	
	POE		15+00.00	6600.0000	
	Tangent Grade:		0.00%		
	Tangent Length:		1400.00		

- ◆ **HorizontalAndVerticalAlignmentReview.xml** - This style sheet displays information on all selected horizontal and vertical alignments. The format is the same as the geometry Review Reports (show previously). This report lists the data for the horizontal alignment followed by the data for its vertical alignments.

List Coordinates with Station Report				
Report Created: 4/8/2009 Time: 8:59am				
Project: 12345DES_Geometry				
Description: SH 86 Design geometry				
File Name: C:\Projects\12345\Design\InRoads\12345DES_Geometry.alg				
Last Revised: cferree 4/8/2009 7:47:57 AM				
Input Grid Factor: 1.00000000				
Note: All units in this report are in feet unless specified otherwise.				
Alignment Name: SH 86				
Station	Point Type	Easting (X)	Northing (Y)	Elevation (Z)
203+80.28	PC	3277567.493605	1556706.066252	6633.1067
203+87.30	PT	3277574.265918	1556704.221427	6633.0867
204+00.00	S+O EVT	3277586.517990	1556700.882339	6633.0505
204+49.33	S+O EVT	3277634.108041	1556687.912502	0.0000
204+50.00	S+O EVT	3277634.758565	1556687.735213	6632.9081
205+00.00	S+O EVT	3277682.999140	1556674.588087	6632.7657
205+50.00	S+O EVT	3277731.239715	1556661.440960	6632.6232
206+00.00	S+O EVT	3277779.480290	1556648.293834	6632.4808

- ◆ **ListCoordinatesStation.xml** - This style sheet displays the X, Y, and Z values along the selected alignment at the specified interval. The Z coordinate comes from the vertical alignment.

EXHIBIT "A"	
PROJECT NUMBER: 12345DES_Geometry PERMANENT EASEMENT NUMBER: Lot1 PROJECT CODE: SH 86 Design geometry DATE: April 8, 2009 DESCRIPTION	
A Permanent Easement No. Lot1 of the Department of Transportation, State of Colorado Project No. 12345DES_Geometry containing 64,036 sq. ft. (1.470 acres), more or less, in Section XX, Township X X, Range X X, of the X Principal Meridian, in X County, Colorado, said tract or parcel being more particularly described as follows:	
Commencing at a point, whence XXXX, said point also being the TRUE POINT OF BEGINNING;	
1. Thence S. 74°30'03" E., a distance of 542.27 feet;	
2. Thence N. 21°25'42" E., a distance of 121.41 feet;	
3. Thence N. 75°37'10" W., a distance of 569.50 feet;	
4. Thence S. 07°55'25" W., a distance of 110.60 feet, more or less, to the TRUE POINT OF BEGINNING.	
The above described Permanent Easement contains 64,036 sq. ft. (1.470 acres), more or less.	
The purpose of the above-described Permanent Easement is for the	
Basis of Bearings: All bearings are based on a line between	

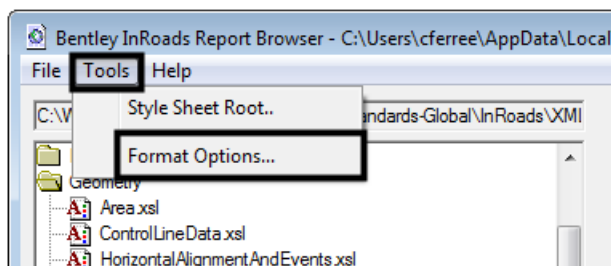
- ◆ **CDOT Permanent Easement Description.xml** - This style sheet was designed specifically for CDOT. It displays the alignment in the proper format for a permanent easement. This report is meant to be saved as a text file and completed in Word.

Formatting XML Reports

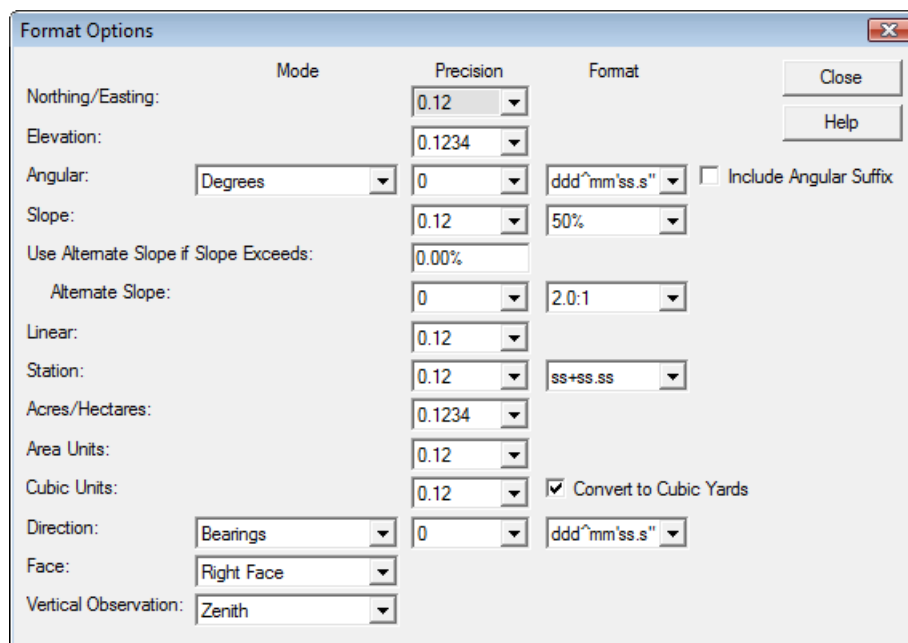
When viewing a Command or Review report, things like precision, station format, and slope format must be set prior to creating the report. With XML reports, data formatting can be changed after the report is generated.

To change the data format in an XML report:

1. Create the desired report as described above.
2. In the **Bentley InRoads Report Browser**, select **Tools > Format Options** from the menu bar.



3. In the **Format Options** dialog box, make the desired changes using the drop down menus. Changes appear in the report as they are made. The illustration below shows the various options available.



4. <D> **Close** to dismiss the Format Options dialog box.

Chapter Summary:

- Reports come from executing a command (like processing Roadway Designer), reviewing geometry, or creating XML reports.
- Some commonly used reports are End Area Volumes, Station Base and Station Offset, and Geometry reports.
- Using the Format Options with the Bentley InRoads Report Browser allows you to make minor changes to the format of the generated report.